ELECTRICAL REVIEW

[ILLUSTRATED.]

A WEEKLY JOURNAL OF

ELECTRIC LIGHT, TELEPHONE TELEGRAPH AND SCIENTIFIC PROGRESS.

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A New Electric Heater.

A heater operated by electricity, by which it is proposed to produce heat in sufficient quantities for the heating of houses, railroad cars, etc., has recently been invented by C. B. Melott, a telegrapher employed at Kingston by the West Shore Railroad Company. The heater for cars is supplied with electricity from storage batteries on the cars. The heater for house or stationary purposes is supplied with electricity from a central station, on the same principle as that of electric light companies. The apparatus operates much the same as the "arc electric light, only the carbons of the electric heater are hollow tubes or pipes of carbon, and are adjusted and operated the same as those on the light. One of the carbons has its end sealed air tight. The other end rests against the end of the second carbon tube, which is connected to an air pipe or reservoir with an air pressure, which allows the air to escape at the point where the two carbon tubes meet, or where the electric spark is formed. When the electricity is applied, an electric spark, in the form of a circle around the carbon tubes, is formed, which allows no air to escape, unless it passes directly through the electric spark. The heat in the spark is very intense, and requires little time to heat all the air that passes through it, thus giving a steady flow of hot air, according to the pressure in the carbon tubes. The electric spark is so intense that large quantities of air can be forced through it and heated without affecting the spark. The electric current of an ordinary electric light is sufficient to heat a large room. The small electric motor in the lower part of the electric heater operates an air blower, and forces the air through the spark."

Electric Light in Austria.

Edmund Jussen, United States Consul General at Vienna, in a report to the Department of State on electric lighting in Vienna, says: The electric companies now transacting business in Vienna have so little capital at their command that they are compelled to insist upon immediate payment for all services rendered and investments made on behalf of their customers. I am assured by gentlemen who are thoroughly familiar with the situation and all its characteristics that any electric lighting company, no matter what its particular system might be, could at once enter upon a most lucrative and thriving business in Vienna, if its capital were sufficient to extend the necessary credit to its customers.

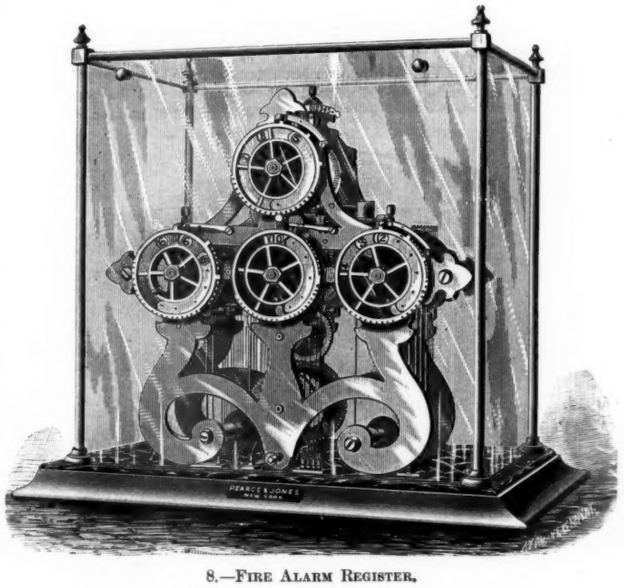
Telegraph and Telephone Wires Down in England.

Mr. George G. Ward, the general manager in New York of Commercial Cable Company, has received the following information from the agent of the line at Bristol, England, regarding the snow storm in England last week:

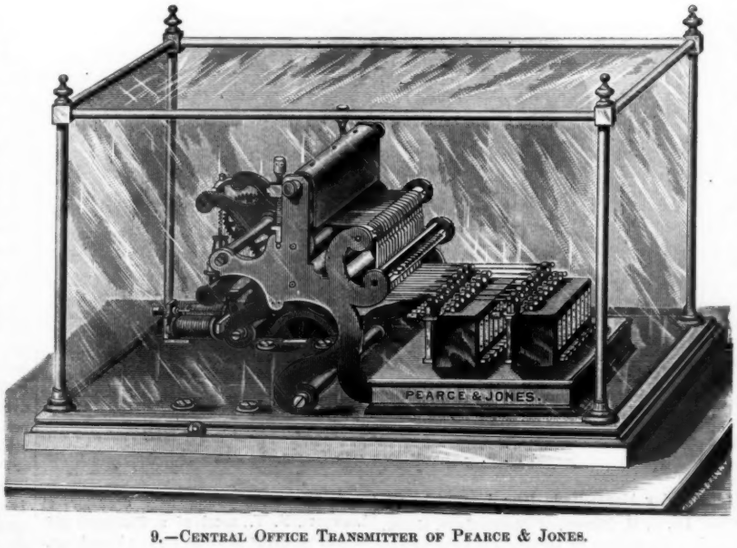
"The snow storm yesterday in England appears to have done an amount of damage to the telegraph wires, which is unprecedented."

The London *Daily News* says: The telegraph wires in the city last night were snapping with alarming rapidity, and in Fleet street the policemen curled the broken ends around the lamp posts. A train on the Midland line was delayed over an hour by the falling of telegraph wires across the track. A large number of telegraph and telephone wires fell last evening over the Metropolitan area. There was very severe weather at Reading yesterday. The snow that fell in the afternoon was heavier than has been experienced for years, whilst the wind blew a hurricane, causing considerable damage to the roofs of houses. Trees were also injured by branches being wrenched off by the violence of the wind.

In Sonning Cutting, on the Great Western Railway, the trains were delayed by snow drifts. On the line from Paddington to Reading, and from Bath to Bristol all the telegraph poles are a perfect wreck, most of the poles being splintered like match wood and lying in all directions. The railway "block" lines being down, the trains are considerably delayed and are signaled along by flags. It seems probable that wires between Bristol and London will not be restored for two or three days. The telegraphs in other directions have suffered equally, as far as can be ascertained.



8.—FIRE ALARM REGISTER.



9.—CENTRAL OFFICE TRANSMITTER OF PEARCE & JONES.

Electricity, Not the Rope.

Dr. A. P. Southwick, of Buffalo, a member of the Commission on Capital Punishment appointed by the Legislature to report a substitute for hanging convicted murderers, was asked by a reporter what the general sentiment on the question seems to be, so far as ascertained. He replied that the committee expected to submit its report to the Governor the latter part of January.

"Electricity," said he, "seems to be the most acceptable substitute for hanging. Neither the prussic acid, nor the poison, nor the garrote suggestion meet with favor. A few persons advocate the guillotine, but this is a barbarous mode of operation. The general sentiment in this country, as well as elsewhere, is that capital punishment is necessary, and the object of our inquiry is to ascertain what substitute for hanging will best be in accord with humanity and the enlightened spirit of the age. The plan advanced is that of an arm chair with metal arms. The condemned person would be seated in the chair, and at the proper moment receive a full electric charge through the metallic arms. This would pass straight through his body, across his chest, and death would be instantaneous. A dynamo of 42 horse-power would be sufficient to accomplish the work with neatness and dispatch."

The Fire Alarm System of Pearce & Jones.

We illustrate this week the Pearce & Jones patented fire alarm system, which is at present in use in New York City, Brooklyn, N. Y., Norfolk Navy Yard, Va., Woodstock, N. B., and other places, and about to be put in operation in the cities of Albany, N. Y., and Salem, Mass. It is one of the simplest, and yet one of the most effective, systems in use at the present day. Cut 1 represents the appearance of the box when closed; cut 2 the box when open. This box contains an automatic for sending the fire signal, which is five rounds of the box number. This is operated by simply pulling the hook, as shown in the cut. This automatic is finely made, and mounted in a round iron dust-tight case, which is again mounted in a round case, containing bell magnet, bell and signaling key, for the purpose of communicating with headquarters, or with other stations. It also contains two switches for grounding either leg of the line or shunting the box out of service when necessary, a lightning arrester and a shunt switch for cutting out the resistance of the bell magnet, when not in use, and which is arranged to automatically operate the bell when lever is pulled, so that the party sending in the alarm may himself hear it. It also puts the bell in circuit when key is used. No. 2 cut shows the inner case is inclosed in outside box for further protection. This box is used extensively in New York City, it having about 700 in service, and the city of Brooklyn about 125. Cut No 3 represents the same style box, mounted in wood case. This is intended for indoor purposes, and most of the large factories, theaters and concert halls

of New York City and Brooklyn are supplied with them.

Figures 4 and 5 represent their new combination box, for sending in different calls. These illustrate the system for ambulance and police calls. The sending of these signals is vested in a switch, which if required may be locked, as shown in cut, the object being to place this under the care of some responsible party who will see that it is not tampered with. The normal position of the switch is at fire, and when police or ambulance calls are to be sent, the lever is placed in position, and, as in the case of fire, is pulled once. The signal adopted for police is P. P. in Morse characters, followed by the number of the box, and that for the ambulance A. B., followed likewise by the box number. In other respects the box is the same as the former two. It has taken so well that the city of New York has already 155 in operation, and has been adopted by the cities of Albany and Salem, Mass., for their new systems.

Figs. 6 and 7 are illustrations of simpler forms of boxes intended for small towns and villages where a few boxes only are needed. They each consist of a firmly made automatic mounted in one strong iron case. The former also contains the apparatus for signaling as that in those above mentioned.

The hinges on all the outside doors are attached on the inside of the case in such a manner that it is impossible to take the door off from the outside.

In connection with their boxes Pearce & Jones have invented and patented a trap lock, which when the key is inserted to open the door, traps and holds it until released by the use of second key.

Fig. 8 represents a 16-pen register, such as at present in use in the central office of New York city and Brooklyn. The operation of this instrument is as follows: The circuit is closed at each tap of the number being received, and in doing so the magnet on the circuit draws to it its armature to which is attached the recording pen, each tap thus making a mark on the paper which runs on a roller, also operated by magnet which starts it at the first tap of the signal.

Cuts No. 9 and No. 10 illustrate two styles of central office transmitter for sending the alarms to the gongs, engine houses and tower strikers. In the former the alarm is set on the dial, and in the latter, which is a more simple form, the circuit wheel, representing the number of the signal received, is placed in position and the handle pulled as in a box.

Cuts 11 and 12 show the tower bell striker, which are made of different sizes to suit large or small tower bells; they are operated by weights, and can be mounted to strike bells all ready in position, and do not require much room. All the parts are strong and durable, and they are simple in operation.

This firm have lately been awarded the contract for fitting up the new central office in New York city, and, as before stated, manufactured the apparatus that has recently been placed in Albany, the outside work being done by the Western Electric Company.

Fig. 1.—Box Closed.

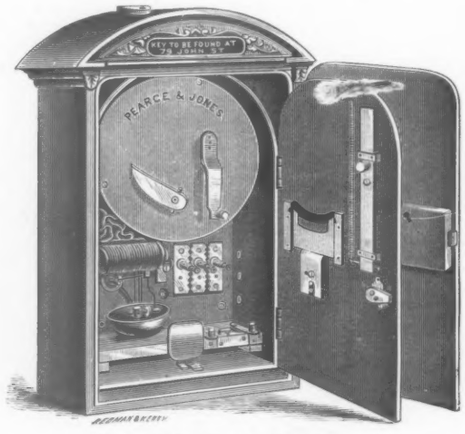


Fig. 5.—New Signal Box, Open.

Fig. 3.—Box for Interiors.

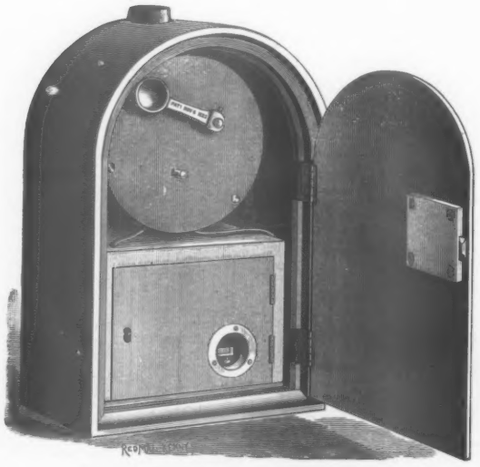


Fig. 6.—Alarm Box for Small Towns.

Burglar Alarm Made Him Jump 17 Feet.

Dr. C. H. Pinney, of Birmingham, Conn., does not believe in leaving his barn unprotected, and so has an electric burglar alarm attached thereto so that no door or window can be disturbed without sounding an alarm. One night this week the alarm sounded. The doctor hastily dressed and Mrs. Pinney kept watch on the barn and the door, which was open. On repairing to the barn the doctor found nothing disturbed, but found that the would-be-thief had escaped from a rear window, and to do this he had to jump a distance of 17 feet before he struck the ground, lighting on a pile of ashes.

Fig. 2.—Box Open.

Increasing the Number of Electric Lights in Philadelphia.

Chief Walker, of the Electrical Department, has scheduled the proposals for supplies to that department for the coming year, and finds that the expenses of lighting the electric lamps throughout the city will be 54 cents per night per lamp. This is a reduction in the expense. The 354 public electric lamps will be increased to 500 next year.

—— A new industry is established in Fitchburg by the recently organized "Fitchburg Manufacturing Company." The company's specialties will be steam engines, small electric light plants, etc.

*** The three young lady operators at Lockport, N. Y., received a Christmas gift of $40 each sent them by their pleased subscribers.

*** The Ludlow acoustic telephone is endeavoring to get a foothold in Rochester, N. Y. The chief trouble with telephones of this class is their failure to work satisfactorily.

Electro-Motors and Their Government.

BY PROFS. W. E. AYRTON AND JOHN PERRY.

The above gentlemen have the following to say on this subject in the London *Electrical Review:*

For some time past articles have appeared in which the moral has been drawn that the principle developed by us during 1882, and published at the end of that year, was wrong, this principle being that in a motor the armature ought to be magnetically much more important relatively to the field magnet than it should be in a dynamo. It has further been stated that our differential methods of winding motors to obtain a constant speed, independent of the load, are unnecessary.

The critics considered that they received great support from two experiments made about a year ago, one of which showed that an Edison-Hopkinson dynamo, weighing 46½ cwt., gave, when used as a motor, a commercial efficiency of 92.6 per cent.; the other, at an experiment carried out by Mr. Mordey, showed that a shunt dynamo, having an armature of very small resistance, ran at a fairly constant speed as a motor, when a constant potential difference was maintained at its terminals. These two sets of experiments have been regarded as giving the death blow to our principles; but as nobody was able to find out anything wrong in them, the critics resorted to the old fallacy of considering that the principles were right in theory, but wrong in practice, forgetting altogether that, if a principle is proved to be wrong experimentally, it must be wrong wholly and utterly.

Either, then, these experiments proved us wrong or they did not; for, being experimenters ourselves, we cannot avail ourselves of the mental loophole kindly offered us by the critics, that we were quite right, but only on paper. It was not our intention to reply to the criticisms until we had completed certain experiments, the results of which will, we anticipate, place the whole subject beyond doubt; but as we have for some time past been very busy with other experiments, and as it is easy to show, as one of us did at the Royal Society last spring, that while the tests of the Edison-Hopkinson machine proved that it was a very good dynamo they proved that it was a poor motor compared with existing motors; further as it is equally easy to show that the dynamo employed by Mr. Mordey in his experiments would be very unsuitable to be used as a motor in the transmission of power, or when a motor has to be moved about it may be desirable for us without more delay to state why we hold exactly the opinions we did in 1882 regarding the proper construction of motors, and why we think that the objections that have been urged are without weight.

During the summer of this year a discussion took place in the *Electrical Review* between Mr. Mordey and "A Student," and Mr. Mordey came to the conclusion that in

1882 we were not acquainted with the principle underlying the experiments described by him in the *Philosophical Magazine* for January of this year and reprinted in the *Electrical Review* for January 8th. We will, therefore, take the opportunity of stating that in 1882 we not only knew, but one of us taught to the students at the Finsbury Technical College that principle, which is as follows: just as a current generator of constant E.M.F. and small resistance, such as a set of accumulators, a magneto machine or a shunt dynamo with an armature of very low resistance running at a constant speed, will give a constant potential difference at its terminals, so such a magneto machine or shunt dynamo will, when used as a motor, run at a constant speed when a constant potential difference is maintained at its terminals. All the excellent work that Mr. Mordey has done during the last few years has interested us much, but our interest in the particular experiments described by him in this year's January number arose from our regarding them as proving on a large scale the correctness of the principles that we had taught for some years previously. Indeed "A Student" (whose name we are totally unacquainted with) expressed our views so clearly in the columns of the *Electrical Review* this summer that we must thank him for making it unnecessary for us to reply at the time.

But although in 1882 we were fully alive to the behavior of a magnetic machine and a shunt dynamo with a very low resistance armature, we did not then, any more than we do now, regard the employment of such machines as a good commercial method of obtaining a motor that runs at a constant speed. For just as we do not consider that the compounding of dynamos to produce a constant potential difference of, say, 200 volts at its terminals is wholly unnecessary, because a shunt dynamo with a very low resistance armature, either running at a very high speed or with very heavy powerful field magnets, will do the same thing, so in a far less degree do we regard the experiments of Mr. Mordey as showing how to obtain a commercially governed motor. A dynamo of the type used by Mr. Mordey, although very valuable for incandescent lighting, could not, we anticipate, be economically used to propel tram-cars, nor electric launches, nor could a small copy of it be used to work portable tools, since we expect that the ratio of its weight in pounds to the useful horse-power given out by it when running as a motor far exceeds 60. Further, such dynamos could not be used as a motor in electric transmission of power, since they required in some experiments 131 amperes to develop 16.3 horse-power, and in others 180 to develop 11.14 horse-power. Let us take the case of 130.8 amperes, and let us assume that the motor gave out about 16.3 horse-power, which is the best result published by Mr. Mordey. Now to transmit 130.8 amperes, calculations show that the most economical section to give to a copper conductor is about one-third of a square inch. But the resistance of one mile of going and one mile of return wire of this sectional area, if made of copper of 98 per cent. conductivity, is 0.1313 legal ohms at 20° C. Hence to send 16.3 horse-power only one mile a waste of 6 horse-power would be produced, which would at once reduce the efficiency of the transmission of 27 per cent.

Fig. 4.—New Signal Box.

And, indeed, the fact that the power given out by a motor is roughly proportional to the product of speed into the current passing through the armature into the electromotive force, and that the latter is roughly proportional to the product of speed into the strength of the field magnets showed us, before 1882, that if the armature of a motor has but very few convolutions of wire, either the speed must be high, or the current must be great, or the field magnet must be large in order that the motor must give out much power.

We had, therefore, in 1882 to start with the fact that in spite of a shunt dynamo, with a very low resistance armature, governing when used as a motor, it could not be commercially used as a motor for ordinary purposes, and that therefore its power to govern was of not much practical importance. The question then arose, was there any fundamental difference in the electrical actions of a dynamo and a motor which would lead one to construct a motor on different lines from a dynamo? According to Dr. Frölich there was not, for in his paper published on November 18th, 1880, in the "Monatsbericht der Königl. Academie der Wissenschaften zu Berlin" (an abstract of which one of us had made for the *Journal of the Society of Telegraph Engineers*,) hes tated that both in a dynamo and a motor the field created by the current passing round the armature diminished the field due to the field magnets, and consequently while the Foucault currents induced in the iron of a dynamo armature weakened the field, the reverse occurred in a motor.

We had, however, to remember that, while Dr. Frölich was in 1878 publishing the very rough equation that the E.M.F. of a series dynamo was proportional to the current, we saw in the same year that the formula which best fitted the results of the experiments which one of us assisted the late Mr. Schwendler in making on a Gramme and a Siemens dynamo at the India Store Department, London, was:

$$E = n\left(e + cC + \frac{aC}{b+C} + \frac{a''C}{b''+C}\right)$$

"1.—A small term, e, due to permanent magnetism of magnet, or core, or the earth, or etc.;

"2.—A small term, c C, due to current in the wire;

"3.—A term, $\frac{aC}{b+C}$ due to mag. of electro-magnet;

"4.—A term, $\frac{a''C}{b''+C}$ due to mag. of core (of armature), which is itself produced by magnetisation of the outer magnet."

When, therefore, Dr. Frölich, at the end of 1880, that is two years later, published, in the communication previously referred to, the formula which has not unnaturally received the name of the "Frölich formula" for the dynamo, but which is simply the formula used by us since 1878, we could not help suspecting that just as he first used a wrong formula for the dynamo, so that now what was new to us about motors in his communication might also be wrong. And we found out that it was wrong, and that, while the last term in our expression given above for E was negative in a dynamo, it was positive in a motor. In fact, our whole theory of the construction of motors contained in our patent of June, 1882, is based on the action of a motor being the opposite of that described by Dr. Frölich. This is the more satisfactory because Dr. Frölich has since adopted our view that while the field due to the current round the armature diminishes the field due to the field-magnet in a dynamo, they help one another in a motor.

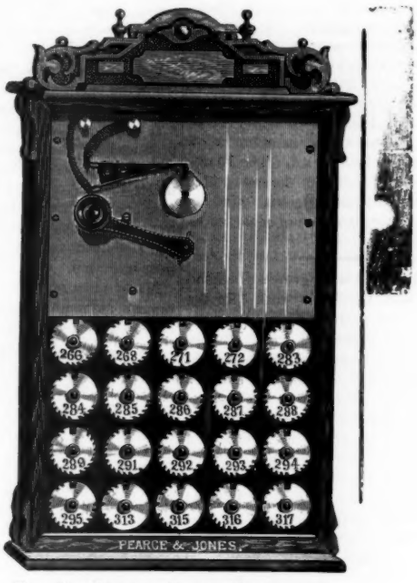


Fig. 10.—Central Office Transmitter.

Fig. 7.—Village Alarm Box Open.

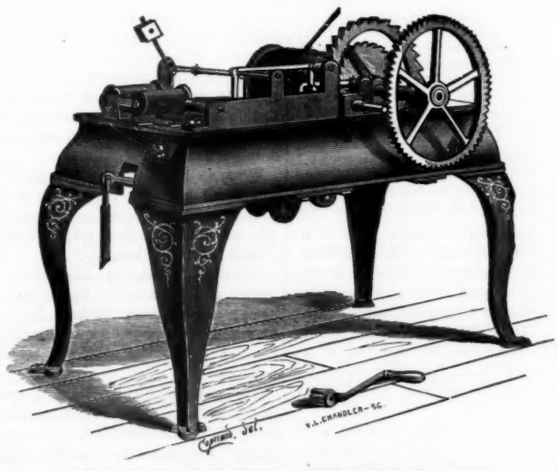


Fig. 12.—Another Form of Tower Bell Striker.

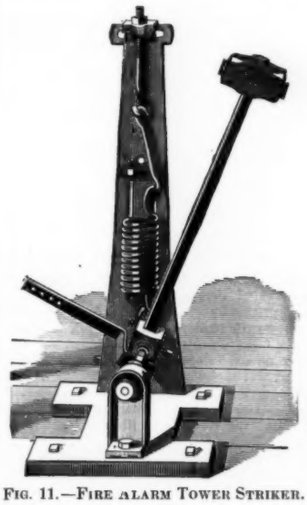


Fig. 11.—Fire Alarm Tower Striker.

Continued on Page Eight.

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We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity and those engaged in Electric Lighting on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

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NEW YORK, JANUARY 8, 1887.

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The increase in our list of subscribers has never been so pronounced and from so many new quarters as during the past two months. This is a true indication of the growing interest in electrical affairs; and, permit us to say, an evidence of appreciation of the efforts of the ELECTRICAL REVIEW in the field it has always conscientiously and earnestly represented.

The Government telephone suit in Massachusetts will be brought directly against the Bell Company at Boston. Otherwise the bill will be similar to that filed by the Government in the Columbus suit. It is expected that the papers will be printed next week and sent to District-Attorney Sterns, of Boston, who will file them. Judge Nelson, of the District Court, and Judge Colt, of the Circuit Court, will try the case. It is not yet known whether or not Justice Gray, of the United States Supreme Court, whose circuit includes Boston, will take part in the hearing, which will probably be set down for the spring term, beginning in May next.

The office of the Ansonia Brass and Copper Company in this city is connected direct with the works in Ansonia, Conn., by means of the new long distance telephone transmitter. The line works like a charm, and is of course constructed of the fine copper wire manufactured by the Ansonia Company. The works of this company are the most extensive of the kind in the world

Shrewd advertisers are availing themselves of the opportunity now offered them of gaining the attention of the public. They must realize the advantage of being represented in a field to which the attention of the whole country is directed. The ELECTRICAL REVIEW is now in the mind and thought of all, and advertisements found in it will be read with interest not accorded to other mediums.

Hard drawn copper is in growing demand for long distance telephone work. In the West a number of extra territorial lines are being built. A new line is in course of construction between Kansas City and St. Joseph, Mo., making direct connection between these two cities, a distance of sixty miles. Heretofore, conversation between these two cities could be held via Leavenworth and Atchison, Kan., but the demand for such service has so increased that the Missouri and Kansas Telephone Company decided to build a direct line of hard drawn copper.

Our daily sunset neighbor, the New York *Mail and Express*, is one of the few successful journals that always has a clean and attractive appearance. The proprietor does not wait until the necessity for new type and new head lines becomes apparent, but instead so often brings out his paper with a complete new dress that his readers—and they are many—are convinced that if not the owner of a type foundry the proprietor is certainly the owner of a prosperous journal. No handsomer or more complete and ably edited afternoon journal is published in the United States than the *Mail and Express*. Its managers have our congratulations.

Our esteemed daily contemporary, the *Sun*, answers a querist who asks, "would it be worth while to study electricity, and, if so, what advantages does it offer to a young man?" in the following very sensible and comprehensive paragraph:

If you have a natural turn of mind toward electricity, and a determination to push to an end any study you may take up, the study of electricity would certainly be worth your while to take up. There are few first-class electricians in this country, and there is probably more "room at the top" for electricians than for any other class of professional men. There are enough second-class electricians, and though to be even a second-class man it might be worth your while to study electricity, it would certainly be much more to your advantage to stand in the front ranks. Experts in electric dynamos and in the subject of incandescent lighting are especially few and far between. The study of electricity will take years, but so will any other study. The Stevens Institute in Hoboken is probably the best place to study the subject both in theory and practical use. The best books are Preece's "Electricity," Gordon's "Electricity and Magnetism," and Dumoncel's books on electricity. They can be obtained from any seller of scientific books.

THE MUCH ABUSED TELEPHONE.

One of the members of the Bar in this State who has graced the Legislative halls, and now resides at the former home of Silas Wright, is a subscriber to the local telephone exchange. In directing the location of his phone he had it placed directly over the hot air furnace register—probably as a counter irritant.

Unfortunately, the other evening, when hurrying to get in his "hello" at the phone, forgetting that workmen had removed the register grating, he stepped into the opening. With great presence of mind, however, he persistently hung on to the usual first syllable and the handle of the phone, and was thus saved from going lower and into threatening cremation.

He now swears by the much abused telephone, and thinks the Legislature should vote it a life saving medal.

ELECTRICITY TO AID THE MUSICAL CONDUCTOR.

An assistant for the musical conductor has long been a want in the domain of public music. Orchestral effects, like stage effects, sometimes require the perfect co-operation of parties or parts which are not within visible reach of each other or the conductor Not unfrequently an unseen chorus is required to keep perfect time unison with the orchestra, which the audience has in perfect view, while the baton of the leader cannot possibly be seen behind the scenes.

A very pretty stage effect is sometimes produced by the singing of a second quartette, who are stowed away above the flies or under the stage, while the four visible performers are moving their lips as if singing the words. The effect is as far beyond good ventriloquism as that is ahead of ordinary poor imitation.

Many inventors have endeavored to arrange some method by which the end sought could be accomplished. The plan is sometimes adopted of having a second conductor, who through a peek hole in the scenery somewhere can watch the movements of the conductor proper, and, by keeping his own wand in time with the leader, hold both movements in unison. This is very unsatisfactory, however, and not always convenient, and many other methods have been designed. The movements of the armature of an ordinary electro-magnet, which, of course, appealed only to the ears of the performers, has been suggested, but it was soon found that these could not always be heard. An attempt was made to use veritable batons, actuated by electrical force through the electro-magnet; but while these, on regular, unchanging drill, continue their pendulum strokes with perfect uniformity, they rebel at any sudden change of time, and are difficult of control when the music reaches a hold, a crescendo or a diminuendo passage, because of the inertia of the moving body.

A Mr. Carpentier has recently called attention to an invention of his which he thinks will thoroughly cover the requirements of the case.

His plan is to have a darkened panel, with two grooves at the two outer edges, placed in such relative positions as to represent the extremes of the conductor's beat. In each of these grooves a rule is placed, so connected with an electro-magnet as to allow it to rotate one-quarter at will. Two opposite sides of each of these rules are so arranged that when one rule is visible, the other rule is not seen because of its blackened surface. The whole is so light and easy of movement that it obeys perfectly the impulses controlled by the key at the feet or hand of the conductor. These movements of the circuit key, when made in unison with those of the baton in the other hand, give the leader as perfect control of two orchestras as otherwise he would have over one.

The eye is here made the victim—imposed upon, if you will—of an optical illusion. The light spot seems really to move precisely as the conductor's baton, but with far more simple uniformity.

What an invention would that be which would duplicate the movements of that excellent conductor of by-gone days—Julien, who was said to conduct with legs and head, as well as with both hands?

Still there is thought—suggestion in this matter of Carpentier's. The unities of the piece performed might, perhaps, be improved, giving possibly more inspiration, better orchestral results, by properly selected influences.

For instance: These light images might be formed to represent a policeman's baton, grasped by the bony fist of "one of the finest," and the effect on the optic nerve would be that of a club flying back and forth with astonishingly life-like vigor—provided that were the nature of the music performed. And, on the contrary, if a dead march was played, the solemnity of the visual movement would be sad and life-like in the extreme. The effect on the players would certainly be noteworthy.

An improvement suggested is that a magic lantern slide may be made to do duty in the premises. Suppose we had for a comic opera, for instance, that old slide we enjoyed so much when young, of "Bottled Porter," where upon the screen a huge bottle was being pecked into by a fellow with a trunk on his back, when "quiker'n wink" he fell into the bottle, which showed the label quoted above. And in the Pied Piper of Hamelin, how would it do to introduce that other slide of our child days which horrified the good little girls and the puny, pale-faced boys who died young—where a one-toothed ogre, with hair and pimples on his big, red nose, never could get enough rats to satisfy his capacious stomach?

In Hibernian opera, as a proper setting, we might have a still more attractive design, which would be cheery as of old. The spectacle of "Pat and the Pig," where piggy was undetermined which of two wrong roads he would go, while the driver ineffectually strove to induce him to take the third or middle path. Inasmuch as Mr. Carpentier has apparently made no arrangement for other than double time, this last is suggested as "just the thing" for triple movements. The "down, left, up," of the conductor's baton would be visibly interpreted upon the stage screen by the movements of the porker as he constantly thwarted the desire of his owner, which was to

"Go straight ahead to Dublin town,
Ye brute, and pay my rint."

The eternal fitness of things might thus be more thoroughly realized, perhaps. But, after all, these attempts to inspire the average horn-spectacled brass blower, or the fat, bald-headed individual who pumps grunts out of the base viol with one hand, while he feels for a soft spot on its neck, that he may choke it to better advantage, with the other, or the little weazened chap with leathery cheeks who plays bellows to a clarionet, are possibly in advance of the orchestra of to-day.

It is doubtful if even Mr. Carpentier's invention is quite generally adopted, let alone these suggested improvements.

CHICAGO ELECTRICAL NEWS.

The Edison people who have for a year and more occupied uncomfortable quarters on the lower floor of the Adams Express Company's building, have climbed one story in the same building, and are now in most commodious and pleasant offices. The mechanical and electrical departments, and the store rooms will remain in their present locations.

Wm. A. Hammett, agent for the New York Safety Engine Company, is patronizing the lithograph people quite extensively. His last effort in that line is the reproduction of a letter from one of the officers of the Minneapolis syndicate in whose block two 75-horse engines are running lights in the block and the opera house. From the reading of the letter it would be reasonable to suppose that the engines are doing good work. Mr. Hammett is also putting in a 13x12 engine of 90 horse-power, for Dr. J. W. Chisholm, in the central plant on Dearborn near Randolph, where it will replace a species of three armed rotary machine built something after the Brotherhood type, which has not proved economical or convenient for the purposes required of it.

The Gamewell fire alarm people have recently captured the cities of Cheyenne and Paducah. The system will be represented in the former city by nine boxes, a gong and a striker. Mr. E. B. Chandler, general western agent, will commence the work at once. Mr. W. Chandlee, Gamewell agent at Richmond, Indiana, will place the Paducah plant, which consists of twelve boxes, one 15-inch gong and indicator, one striker, and one tapper.

The Pond rapid system, a subordinate form of fire telegraph, belonging to the Gamewell Company also, is to be placed by Mr. Chandlee in the machine shops of the Pan Handle Railway at Columbus and at Denison, Ohio.

The Waukegan Electric Light Company was incorporated on the 27th of December, with a capital stock of $5,000. The objects of the company are to furnish light and heat. Incorporators are George R. Lyon, Edmund D. Besley, John F. Kuhn, C. A. Murray, and R. S. Perrine.

The Chicago Electric Company was recently incorporated. E. W. Friott, Charles H. Cowles, R. J. Kittredge incorporators, with $10,000 capital stock.

In the Circuit Court at Evansville the other day, the city instituted suit against the Cumberland Telephone and Telegraph Company, asking the court to cancel the rights of way of the defendants through the streets and alleys, on the ground that the present company is an alien, which, belonging in and incorporated by the State of Kentucky, has no power to maintain and operate a telephone system in Indiana. That it acquired these tacit rights by the purchase of the franchises and rights of the former existing company, the Evansville Telephone Company of Evansville, an organization which since about June 30, 1883, has ceased to exist.

Sandusky, Ohio, recently increased its central plant, which is made up of both Brush and Western Electric systems, by an addition of thirty-four lights and a dynamo of the latter company's forms.

Another of the Chicago places of amusement is being arranged for electric lights, but the plant will not be put in operation for a few weeks yet.

Parties here are quietly experimenting with a form of dynamo which has not yet seen daylight, but which those interested claim will show a decided advance in the direction of economy. Those who are assisting in the matter are some of them old enough in electricity to be relied upon, and they insist, as the Frenchman has it, that "the machine she will very well fonction, with much of economy."

Then again, the party who is about to light us all up with incandescent lamps fed by a primary battery, has been heard from again, and is preparing his surprise for us.

And these are forecasts for the New Year.

CHICAGO, Jan. 3, 1887.

GENERATION OF ELECTRICITY BY STEAM AND COLD ATMOSPHERE.

To the Editor of the Electrical Review:

I drop you a few lines to relate a rather singular electrical experience which occurred one day last week at Garrett, Ind., on the Baltimore and Ohio railroad. I think that some of the bright minds might take the question up and give the reason for it.

We were putting in an electrical light plant for our shops at Garrett, and a circuit of No. 4 copper wire was being strung. The wire had been partly placed but was open in a number of places, nor had the dynamo been set up. My foreman found that when he went to connect a coil of wire which was lying on the ground to the wire which was on the cross arms that a heavy spark about a quarter of an inch long would fly from the wire on the poles to the coil on the ground. The current was so strong that the men believed the dynamo had been connected. My foreman, Mr. A. Stevens, discovered that when an engine which was standing about 25 feet from the line of poles upon which the electric light wire was strung would blow off her pop valve the current would be generated and it would cease immediately afterward until the pop valve set so as to keep the steam from escaping and there would be no current until the steam escaped again. I have never had any experience similar to this nor have I ever heard of it, but I thought it might be of some interest to your readers.

My foreman states that as it was a very cold day he thinks the hot steam forcing itself suddenly into the cold atmosphere gave rise to the thermal current, and he humorously suggests that possibly by running a steam pipe into an ice house so arranged as to pass rapid vibrations, so to speak, of steam, that he could supply an electrical force very cheaply. Yours truly,

C. SELDEN,
Gen'l Sup't Tel. B. & O. R. R.
Baltimore, Dec. 28.

BOSTON ELECTRICAL NEWS.

It seems probable that one of the acts of the new city government will be the appropriation of money for a Police Signal system. The efficient working of an experimental plant in one of the divisions has been so satisfactory that the police force are clamoring for its extension. The arc light has had no better friends than the guardians of the peace, and no class of men are more ready to adopt new electrical devices.

An automatic sprinkler which works like the excellent thermostat of the Martin-Wilson Automatic Fire Alarm Company, by the expansion and contraction of some hydrocarbon vapor is being discussed. Up to the present time no automatic sprinkler would turn off the water as the temperature of the surrounding air fell. This new device, like the thermostat, requires no adjustment or attention after being set in operation by a fire.

In an interview with Gen. Joe. V. Meigs, a REVIEW reporter learned that the trials of his system before the railroad commissioners had been unusually successful. Notwithstanding the numerous breakdowns which the road has had, many of which were caused to occur for the purpose of fully testing the system, not a single person has been injured. The report of the railroad commissioners on this system is very favorable. Gen. Meigs has been a long time developing his system of elevated railroad transit—rapid but slow to come.

There is a movement on foot to organize in Brockton, Mass., what is to be called the Economic Gas Light Company with the intention of supplying gas to Brockton, Rockland, Whitman, Abington, East Bridgewater, Easton, Stoughton, and East Stoughton. The latest rumor is that there is to be a consolidation of the above mentioned company, the Brockton Gas Company, and the Jenney and Edison Illuminating Companies of the same place. The New York parties interested in the scheme "claim" that they have new and inexpensive process for making a superior quality of gas.

The West End Railway Company, among the stockholders, of which there are, Asa P. Potter, Eben D. Jordan, Jonas H. French, have been granted locations in Boston and Brookline. If the experiments now in progress in New York, with storage batteries and electric motors prove successful, that system will be adopted. The route begins at the junction of Marlboro street and Westchester Park, through Beacon street by way of Brookline to Washington street in Brighton as far as the crossing of Cambridge street. The stockholders in the road are largely interested in unoccupied land along the line of the proposed railway.

Kimball and Davis have recently made a metallic spiral thermostat. About 12 turns of flat steel wire are coiled around a standard. The upper end of the spiral is free and terminates in a point about half an inch long. Two adjustable screws make contact with the end of this arm, one when the coil is affected by an increase of temperature and twists in one direction, the other screw makes contact as the spiral twists in the opposite direction as the temperature falls. Two circuits may therefore be established and signals given. As a means for indicating variations in hot houses, cold storage warehouses, drying rooms, it will come into general use.

Mr. James S. Stone, corner Purchase and Pearl, a short time since installed one of the new ten horse-power Sprague motors, 220 volts potential. He was so well pleased with its performance that he has since ordered a second one. This motor is situated about 4,000 feet from the station, and easily lifts two tons sixty feet per minute.

The rumor of a consolidation of the Brush Electric Lighting Company and the Boston Gas Company is said to be absolutely without foundation.

The assistant engineers at the Edison station are for noon watch, Robert Coburn; night, John Kelly; middle watch, George Godfrey. James Crosby still takes charge of the lamp regulation. During the holidays for a few hours the output of the station was 2200 amperes, a 50 horse-power Armington & Sims engine driving two 200 ampere dynamos has been recently placed between two of the larger engines. The station is now much crowded. The excellent service given by the company reflects great credit on those in charge of the machinery.

Another competitor for favor as an elevated railway system is that of R. S. White, 148 High street. It is claimed that it is an improvement on the Meigs system.

Geo. H. Hartwell, the popular and well-known lecturer on electrical subjects, is to give an electrical entertainment at Tremont Temple, Wednesday evening, January 12 Some of the attractions are electric stereopticon, with numerous beautiful dissolving views never before accomplished by electricity. Practical illustrations in arc and incandescent lighting. A ½ size model of the Enos railway will be shown in operation, the car lighted by incandescent lamps. Sewing machine, ventilating fan, operated by motors receiving current from the perfected storage battery (as made by M. Julien). A living representation of Liberty Enlightening the World. The lecture begins at 8 o'clock.

The average resistance of 50 electricians recently measured in Boston is 1000 ohms.

In the consolidation of the Merchants' Electric Light and Power Company and the Brush Electric Lighting Company, five shares of the capital stock of the new company, the Boston Electric Light Company, may be received in lieu of a bond of the new company any time before January 30, 1888.

Sowdon, Elder & Wright, of Boston, have during the past week sold installations of the American system to the Edison Illuminating Company, of Lawrence, Mass., and to the Somerville (Mass.) Electric Light Company.

BOSTON, Mass., January 5.

Mr. H. L. Roosevelt, of the Leclanche Battery Company, and widely known for extensive electrical work, died in this city last week, after a short illness. His death will be regretted by a large circle of friends, and takes off in his prime one of the most successful and progressive men in the electrical field.

Mr. F. R. Wells, manager of the Western Electric Company, at Antwerp, is in the city and will visit the general offices of his company at Chicago while in the United States. The business of the Antwerp house is continually increasing under Mr. Wells' able management. He was an interested visitor at the Electric Club on several occasions.

The astonishment created in a certain telegraph office on receipt of a dispatch announcing the extraordinary event published below, can be readily understood by every operator. The superintendent of a Sunday school, after conferring with a manufacturer of Christmas placards for Sunday school use, said that he would telegraph the sentence he wanted with the size of the frame and the hour at which it must be ready. The telegram read: "At 6.30, unto us a child is born, six feet long and two feet wide."

Says the Chicago correspondent of the N. Y. *World:* "The elegant-looking gentleman just stepping from a Madison street car is the right hand of Jay Gould in Chicago—Col. Clowry, Duke of Western Union, and Ankoond of Ocean Cables. He is the Beau Brummel of telegraph men, and has never been known to lose his temper. Only a few years ago he was a bitter, fighting enemy of Jay Gould, but, as in the recent case of John G. Moore, becoming a Western Union man, Mr. Gould silenced an enemy by employing him as a friend. Col. Clowry is a diplomat, and his general characteristics may be summed up in Jay Gould's own words when referring to Clowry: 'The Colonel is devilish clever.'"

ELECTRICAL NEWS FROM THE SOUTHWEST.

To the Editor of the Electrical Review:

This town has now enjoyed (?) a year of telephone competition, and if the unasked testimony of subscribers is to be believed, they have all had about enough, and will be glad when it is over. The beauties and "advantages" of two rival exchanges in the same town have been thoroughly shown. And if Rochester or any other parties who think they are dissatisfied with Bell agents and their service, will write to any Little Rock merchant, they can probably get all the points they want.

A pair of "tuffs" held up two of our young lady operators on their way home one night this month, and relieved one of them of her purse and fifteen dollars, the other hung on to hers and so saved her wealth. But it's a cold day when "Central" gets left, as the robbers discovered in the end. For the girls after chasing them about a block, used the telephone to such purpose and described the rascals so well that they were captured before morning. They have confessed, got their sentence, and now wear stripes and work for the State. Moral, for robbers, let telephone people alone.

A countryman came into the exchange a few days back to talk to Hot Springs, and while waiting for the person he wanted, concluded "that durned thing went too fast." So he stopped the pole changer and was much surprised when the chief operator came flying in to find out what was the matter. The pole-changer is a great curiosity to most of our visitors, and strange are the questions and queer the answers about it.

Speaking of the wire from here to Hot Springs reminds me that it is something of a curiosity also. It is about sixty miles long, and undoubtedly the noisiest ever built. Can't say whether the hot water at the Springs has anything to do with it or not. But of all the howling, spitting, frying, sizzling, and whistling, ever heard over a telephone line, it can certainly get up some of the worst. One would think all the imps were holding high carnival. In some kinds of weather (not storms) it is impossible to use it at all. At other times it is as quiet as a church, and works as well as any short wire in the exchange. Every telephone man that listens to it pronounces it "the worst they ever heard." It is a great weather prophet, though, and if we could only "catch on" to its cypher we could get ahead of the signal office every time. As it is we can guess most as close on an average.

An inspector told me a new one lately. He was at a residence and had taken the battery jar out, which was about half full of solution. The small boy of the house was looking on, and asked if "that came out of the telephone," on being told it did he gravely remarked, "he never thought the folks could slobber that much."

A couple of our Pan-Electric citizens have bought a "new telephone," the patent of an Indiana genius. "Warranted not to infringe, much superior to the Bell, Long distance" etc., etc. And the heavy weight of the firm has started for California to sell it and the Californians. Wonder how well he will succeed!

RUHTRA.

Little Rock, Ark., Dec. 28.

The new wholesale dry goods building of Marshall Field & Co., Chicago, will be lighted with the arc lighting system of the Eastern Electric Company. This extensive building covers an entire block, bounded by Fifth Avenue, Adams, Franklin and Quincy streets, and the plant furnished by the Western Electric Company will furnish 180 full arc lights. This will comprise a very extensive and complete isolated plant.

The telegraph operators along the line of the Lake Shore between Buffalo and Cleveland will give their annual ball at Music Hall, Erie, on the evening of January 19th. Special trains east and west will be run for the accommodation of those wishing to attend the ball.

Telephonic News

⁂ Messrs. Dann & Lapp, of Honeoye Falls, N. Y., claim to be the possessors of a "telephone that does not infringe Bell." Now, if these gentlemen can prove their claim the citizens of Rochester will give them hearty greeting, but we doubt it.

⁂ The telephone ball at Kansas City, Mo., December 16th, was a pronounced success. The attendance was large, the electric features unique and interesting, and everything passed off very pleasantly. The employes of the Missouri and Kansas Company are the only ones who give an annual ball.

⁂ The meeting of the stockholders, to ratify the action of the directors of the Missouri and Kansas and United Telephone Companies in the matter of consolidation, will be held the latter part of this month. There is little doubt but the action will be affirmed and both companies benefited by the consolidation.

⁂ The Erie Telephone Company is preparing to extend its lines from Dallas to Southeast Texas towns *via* Corsicana and Houston. Dallas merchants are being induced to take stock in the new line on the coupon plan—the stock to be paid up in full and the coupons to be received in payment for messages sent or received. The new territory to be penetrated is now without either telephone or telegraph facilities. When the new line is built it will make the total mileage of telephone wires centering at Dallas aggregate 4,000 miles.

⁂ The Cumberland Telephone Co. has a number of suits filed against it in the Evansville, Ind., Circuit Court, aggregating $90,000. The suits grew out of the old quarrel between the City Council and the telephone company. The Council of Evansville, while possessed of the disease known as telephobia, revoked the telephone company's right of way in the streets and alleys, and cut the poles and wires. The councilmen and fire chief were arrested at the instance of the company, charged with malicious trespass; and now the councilmen come back at the company for $10,000 damages for false imprisonment. The Sheriff has attached all the telephone property.

⁂ In speaking of the recent lecture of C. L. Chapin, of Philadelphia, the Rahway (N. J.) *Democrat*, of Dec. 9th, says: "According to announcement, Professor C. L. Chapin delivered his lecture on electricity in the Baptist Church on Thursday evening of last week. The sudden cold snap no doubt kept many away (although Rahwegians are known for their non-attendance at lectures), and the audience was small. The lecture was very interesting, especially the portions which were illustrated by experiments. Mr. Chapin is now the oldest telegrapher in the country, and is an enthusiast on the subject of electricity. Those who stayed away missed a rich treat."

⁂ The large cable put down at San Francisco by the Postal Telegraph Company consists of three lengths of one mile each. There will be two splices, and as there are seven strands in each cable there will be fourteen connections. In each strand there are three copper wires · these are covered with kerite, and this covered with rubber tape to prevent any water from possibly finding a way through. The seven wires are then bound together by hemp cording and the whole is covered by an armor of No. 4 galvanized iron wire to prevent it from breaking. When all these coverings and iron wires are to be connected it makes a very difficult job. The total weight of the cable is 37 tons. The cable was manufactured by A. G. Day & Co. Mr. Clark Hotchkiss, the general agent, having successfully made the contract.

Comments of the Man at the Telephone.

The telephone at the police station in Hartford rings out a hurried and repeated call.

An officer jumps to his feet and rushes to the telephone.

"Hello!"

"Hello! Is that the police station?"

"Yes, what's wanted?"

"Send the wagon down to the dyke, quick."

"We haven't got a wagon."

"I mean the patrol wagon, send it down to the dyke, quick."

"There's no patrol wagon here, and it hasn't been here for several days; what's the matter?"

"Why, they are shouting 'Murder' down here and crying for the police, and I've rushed up to the nearest telephone so as to get assistance."

"Well, sir, I am sorry; but we've got no wagon nor officer to send down; you will find a man on that beat."

"I'll find a man, eh? Well, I guess not. He is down there, and will probably be killed. I'll just let him do his own calling for help. But what has become of the patrol wagon?"

"I don't know; they say the horses are not feeling just right."

"Well, I don't blame them. But when horses become disgusted, it's a pretty bad case."

"You don't understand me. The horses are sick and the wagon cannot be used."

The indignant man at the telephone shouts back: "If you would swap off some of the snails that come under your department, and get a good working team, you would have something to do police business with."

New Men to Build the Subways.

Subway matters took on a more promising appearance when the construction company—otherwise the Consolidated Telegraph and Electrical Subway Company—consummated its long anticipated reorganization last week. All the subscribed stock, including that recently taken by the electrical companies, was represented, and considerably more than half of the authorized stock of the company was voted. These are the directors chosen: Edward Lauterbach, E. E. Gedney, cashier of the North River Bank; Theodore N. Vail, President of the Metropolitan Telegraph and Telephone Company; Edward J. Hall, Jr., General Manager of the American Telegraph and Telephone Company; Robt. M. Gallaway, Vice-President of the Manhattan Elevated Railroad Company; Richard A. Elmer, President of the American Surety Company; William H. Woolverton, President of the New York Transfer Company; Frederick Lovejoy, President of the Ball Electric Light Company, and Samuel Carpenter, President of the Iron Steamboat Company.

These, with the exception of Messrs Lauterbach and Gedney, are all new names, and they all represent actual stock subscriptions, and have each consented to serve in the Board.

At a subscription meeting of the Directors Edward Lauterbach was chosen President: William H. Woolverton, Vice-President. A. F. Dodd, Treasurer of the Metropolitan Telephone Company, Treasurer, and William J. Sefton, Secretary.

The contract entered into with the Phœnix Construction Company by the old Board was reported to the stockholders, and ratified. The Phœnix Construction Company is a subordinate organization, composed of the representatives of the Metropolitan Telephone and Western Union Telegraph Companies. Its contract calls for the construction of 800 miles of ducts, which, should the subways average ten ducts each, would be eighty miles of subway. This is supposed to be the amount of work to be accomplished with the money subscribed by the electrical companies, and the arrangement gives to those companies, practically, the control of the expenditure of their contributions. The Phœnix Company also filed a guarantee bond for the faithful performance of their contract, which was approved by the meeting.

Suggestions were then made for practical and energetic work to be begun in the early spring and pushed with vigor throughout the summer and fall, all of which were referred to a Board of Engineers yet to be constituted.

The general sentiment of the meeting was that at least twenty miles of subway should be built during the coming season, and, if possible, twice that amount. It was represented that all the telegraph and telephone companies were now anxious to get their wires underground, and that the electric light companies were also rapidly becoming converts.

Casting Aluminum Bronze and Other Strong Metals.

Mr. Thomas D. West, who had charge of erecting the Electric Smelting Works for Messrs. Cowles at Lockport, N. Y., read the following paper upon the above named subject before the Society of Mechanical Engineers at its meeting held in New York, Nov. 29 to Dec. 3.

The ability to cast in molds a material which possesses strength equal to the best forgings of wrought iron and steel, is an achievement which mechanical engineers may well be interested in. While it is true that the strongest metals are susceptible of being cast, yet there are peculiarities about them which cause greater inconvenience and expense in the effort to procure good, solid, clean castings than occur with cast iron. These come mainly from the difficulties in overcoming the evils due to oxidation, shrinkage and contraction. These elements, of course, exist in the founding of cast iron; but the degree to which they make labor and trouble is very slight as compared with stronger metals. The list of these latter is now enlarged by that comparatively new metal "aluminum bronze" and the experience of the writer is here to be cited in his endeavors to establish principles and methods for its successful molding and casting in the foundry of Cowles Electric Smelting Company, the firm manufacturing this bronze and other alloys of aluminum, at Lockport, N. Y. It is hoped, also, that ideas may be presented which may, in many cases, prove of value for the making of castings from other metals.

The difficulties which beset the casting of aluminum bronze are in some respects, similar to those which were encountered in perfecting methods for casting steel. There is much small work which can be successfully cast by methods used in the ordinary molding of cast iron; but in peculiarly proportioned, and in large bronze castings, other means and extra display of skill and judgment will be generally required. In strong metals there appears to be a "red shortness" or degree of temperature, after it becomes solidified, at which it may be torn apart, if it meets a very little resistance to its contraction, and the separation may be such as cannot be detected by the eye, but will be made known only when pressure is put upon the casting. To overcome this evil, and to make allowance for sufficient freedom in contraction, much judgment will often be required, and different modes must be adopted to suit varying conditions. One factor often met with is that of the incompressibility of cores or parts forming the interior portion of castings, while another is the resistance which flanges, etc., upon an exterior surface, oppose to freedom of contraction of the mass. An illustrative case, which the writer had to deal with in the foundry referred to above, was the casting of some blast furnace tuyeres, the dimensions of which were about twelve inches diameter at the small end, and fourteen inches diameter, at the large, and seventeen inches long. These tuyeres were made hollow for the passage of water to keep them cool when the furnace was in blast. The core to form this hollow space was one which foundrymen would term a "mean core" to make and to use, and the stronger it could be made by means of the mixture of the sand, the easier would it be to make and to handle. But it proved at the hydraulic testing of the first casting that these conditions were the worst for causing leakage. It was found that in order to procure a casting which would not leak, the core must be "rotten" and of a yielding character. This was obtained by using rosin in coarse sand and filling the core as full of cinders and large vent holes as possible, and by not using any core rods or irons. The rosin would cause the core, when heated, to become soft, and would make it very nearly as compressible as a "green sand" core, when the pressure of contraction of the metal would come apon it. It might be well to state that the size of this core was such as would leave one inch thickness at each end, and one-quarter inch at the inner and outer sides of the casting, and was all surrounded with metal, excepting four one-inch round openings through which the core delivered its vent or gas. By means of dried rosin or green sand cores, we were able to meet almost any difficulties which might arise in ordinary work from the evils of contraction, so far as cores were concerned. For large cylinders or castings which might require large round cores which could be "swept," a hay rope wound around a core barrel would often prove an excellent yielding backing, and allow freedom for contraction sufficient to insure no rents or invisible strain in the body of the casting. To provide means for freedom in the contraction of exterior portions of castings which may be supposed to offer resistance sufficient to cause an injury, different methods will have to be employed in almost every new form of such patterns. It may be that conditions will permit the mold to be of sufficient yielding character, and again it may be necessary to dig away portions of the mold, or loosen bolts, etc., as soon as the liquid metal is thought to have solidified. In any metal there may be invisible rents or strains left in a casting through tension when cooling sufficient to make it fragile or to crack of its own accord, and it is an element which, from its very deceptive nature, should command the closest attention of all interested in the construction of castings.

Like contraction, the element of shrinkage is one often found seriously to impede the attaining of perfect castings from strong metals. In steel castings much labor has to be expended in providing risers sufficient to "feed solid" or prevent "draw holes" from being formed, and in casting aluminum bronze a similar necessity is found. The only way to insure against the evils of shrinkage in this metal with work requiring "risers" or "feeding heads" was to have them larger than the body or part of the casting which they were intended to "feed." The "feeder" or "riser" being the largest body, it will, of course, remain fluid longer than the casting, and as, in cast-iron, that part which solidifies first will draw from the nearest uppermost fluid body, and thus leave holes in the part which remains longest fluid. The above principle will be seen to be effective in obtaining the end sought. It is to be remembered that it is not practical to "churn" this bronze, as is done with cast-iron. A long cast-iron roll, one foot in diameter, can by means of a "feeder" five inches in diameter and a half-inch wrought iron rod, be made perfectly sound for its full length. To cast such a solid in bronze the feeding head should be at least as large as the diameter of the roll, and in length about one-quarter longer than the length of roll desired. The extra length would contain the shrinkage hole, and when cut off a solid casting would be left. This is a plan often practiced in the making of guns, etc., in cast iron, and is done partly to insure against the inability of many moulders to "feed" solid, and to save that labor. There is nothing in the way to prevent obtaining large guns of aluminum bronze as perfect as are made of cast iron. It is simply a question of having enough "riser" or "feeding head," and such guns would surpass in strength any other metal now used in their manufacture.

A method which the writer found to work well in assisting to avoid shrinkage in ordinary castings in aluminum bronze, was to "gate" a mold so that it could be filled or poured as quickly as possible, and to have

the metal as dull as it would flow, to warrant a full-run clean casting. By this plan very disproportionate castings were made without "feeders" on the heavier parts, and upon which "draw" or shrinkage holes would surely have appeared, had the metal been poured "hot."

The plan or principle adopted in pouring this bronze, is similar to that employed for casting steel, which, as is well-known, consists in pouring through a spout controlled by a valve, which lets the metal flow from the bottom of a ladle instead of the top or lip, as practiced in pouring cast iron. The exact plan which the writer used for castings weighing over fifty pounds, was to make the pouring basin sufficiently large to contain all the metal necessary to fill the mold, and give any surplus which might be required for a "flow-off," or to fill up "feeding heads," etc., and so prevent any metal from flowing into the mold until it was all in the pouring basin. The entrance of the gate would be stopped by means of an iron plug, and the moment all was ready, it would be pulled, and the metal would almost instantly fill the mold, so large would its gates be made. By such a plan it will of course be readily seen that there is no danger of any "scum" or oxide entering the mold, an element which would seriously mar the appearance of a casting. Besides the difficulties from difference in the color which resembles gold, such oxide would be very liable to cause a disunion of the particles of the body, or make an unacceptable surface when the casting was finished up. The metal itself is one that works well in our ordinary molding sands, and "peels" extra well. As a general thing, disproportionate castings weighing over 100 pounds, are best made in "dry" instead of "green" sand molds, as such will permit of cleaner work and a duller pouring of the metal, for in this method there is not that dampness which is given off from green sand mold, and which is so liable to cause "cold shuts." When the position of casting work will permit, many forms which are proportionate in thickness can be well made in green sand by coating the surface of the molds and gates with silver, lead or plumbago. Information upon manufacturing, strength and melting of aluminum bronze, can be found in an article from the writer published elsewhere.

From "blow holes," which are another characteristic element likely to exist in strong metals, it can be said that aluminum bronze is free. Should any exist it is the fault of the molder or his mold, as the metal itself runs in iron molds as sound and close as gold. Sand molds to procure good work must be well vented, and if of "dry sand," thoroughly open sand mixture should be used and well dried. The sand for "green sand" work is best fine, similar to what will work well for brass castings. For "dry sand" work the mixture should be as open in nature as possible, and for blacking the mold, use the same mixture as are found to work well with cast-iron.

The different problems of making strong metal castings all present peculiarities which call for special treatment in the manner of molding, etc., but, as said in the beginning of this paper, the difficulties to be overcome mainly hinge more or less upon one or other of the three elements, oxidation, shrinkage, or contraction. These are being controlled better every day, and progress is made by which almost any kind of casting can be procured as readily as of cast iron. With aluminum bronze, "Mitis," and steel castings to be had, the engineer should not want for strong metals to meet almost any conditions which he may desire.

.... Henry Carroll, an operator for the Baltimore & Ohio Telegraph Company, at Cincinnati, was arrested on a charge of murder. Carroll and Cornelius Sweeney, a shipping clerk, quarreled in a saloon and went outside to settle the difficulty. In the encounter both men fell heavily on the sidewalk, Sweeney underneath. They were separated and taken to their homes. Sweeney died.

AN INTERESTING LETTER.

Electrical News from Northern New York—The Telephone Trouble at Rochester.

To the Editor of the Electrical Review:

The hornet's nest that was disturbed by the Bell telephone people, by reason of the Rochester agitation, is bearing fruit abroad. The Central New York Telephone Company recently made application to the Syracuse Common Council to renew their contract, which expires soon. They propose to do business on a basis of $48 for one-quarter mile radius, $60 for three-quarter mile, and not to exceed $6 for every quarter mile over that distance, and offer to make these the maximum rates. No action was taken by the council, and the opinion seems to prevail that the rates shall be revised before the company obtain a franchise.

Rochester is still agitating the telephone question, and seizes every piece of information, such as the above, with the greatest relish. It was rumored in Rochester some time ago that the Utica subscribers had gone out. Of course, there was no foundation for the rumor; but it gained credence and a large circulation.

The subscribers met recently and voted to organize the People's Telephone Association, under the General Act, instead of under the Telephone Act. The capital stock has been fixed at $100,000. The shares are to be par $50, to be taken by the subscribers, only a limited number being sold to any one individual or firm. About 350 shares are reported already subscribed.

The Bell Telephone published recently a letter addressed to the subscribers of the Rochester Association, stating that, had the subscribers made their remonstrance in a business-like way, and, if not satisfied with the schedule of prices offered, appointed a committee of business men to wait on the company, and submit a protest, the company would have been glad to go over the whole ground, and would, no doubt, have come to an understanding with them, as the company has been ready to make reasonable concessions.

In answer to the above, the association have remonstrated by saying the vice-president and his associates were waited on six times, officially and unofficially, by the subscribers, who urged, as strongly as they were able, their remonstrance and the request that the company make some concessions to the subscribers, stating their willingness to compromise. The company, they state, repeatedly urged the justice of the charges, and evaded the question, until endurance could no longer be entertained.

If reports are true, the company have been, to say the least, unconcerned as to what the subscribers might say. Probably a large part of the opposition to the proposed change arises from the continual jealousies between Rochester and Buffalo people. At any rate, the association seem in earnest, and if a new system can be introduced that can successfully cope with the Bell Company, the people will not be slow in accepting it. As it is now, the telephone is practically unused, and will be for an indefinite time. The messenger companies have been taxed to their greatest capacity, to accommodate the business now thrown upon them.

The Bell Telephone Company, of Buffalo, are awake to the demand of the times, as will be seen by the following petition presented to the Common Council:

Your petitioner, the Bell Telephone Company, of Buffalo, respectfully petitions for authority to construct underground conduits in the public streets of Buffalo for the purpose of carrying and maintaining its wires therein. While no experiment has demonstrated that telegraph and telephone wires can be carried long distances underground successfully and the extent such wires may be carried underground may be yet regarded as experimental, still sufficient has been done to warrant the belief that such wires can be carried advantageously in underground conduits a distance sufficient to relieve the crowded thoroughfares of our city. Your petitioner appreciates the present crowded condition of our chief thoroughfares by the various wires and the just complaint from the public, and is ready to proceed, as soon as practicable, to lay wire underground in case you will give the proper authority.

One more bit of telephone news. The Rochester (Bell Telephone Company) erected a pole at the corner of Union and Court streets, after the stampede and resolutions by the City Council revoking the charter of the telephone company. The pole setting was decided an infraction of the law and a nuisance, and one to be removed. The company asked for an injunction preventing any interference by the city authorities. The application was made before Judge Rumsey. The case was adjourned until this week.

In his argument for the city Attorney Powers pleaded that the telephone company, although organized as a telegraph company, was not one in fact. If a decision is rendered on this point, it will form a new nut for our telephone friends.

Schmidt, Koelber & Co., the Northwestern agents of the Sawyer-Man Electric Company, are installing a (S. M.) plant in the new Shawmut Flour Mill, of seventy lamps. This mill is considered a representative one, and I understand is to be opened with a banquet. Schmidt, Koelber & Co., have sold the E. H. Cook Distilling Company, Buffalo, a seventy light Sawyer-Man plant to be placed in their distillery.

The Edison Company have installed a plant for G. D. Barr, Buffalo.

The Westinghouse distribution system is in operation at Buffalo. They have already 400 lights in Meldrum, Adams & Co.'s store, and I understand have their installation in the Tifft House running now. H.

Syracuse, N. Y., Dec. 31.

. .. During the hostilities with France in 1884, the Celestial Government appears to have become aware for the first time of the fact that by the aid of the telegraph it is possible for a central administration to keep a much firmer control over provincial authorities. This fundamental fact having once been realized, the authorities are busily engaged in extending lines in all directions between Pekin and the great provincial towns. The material is all bought either in this country or in Denmark, but the work of construction is carried out almost entirely by the Chinese themselves. The first lines were built by Danish engineers and workmen, but the Chinese proved themselves such apt pupils, that in a very short time they felt competent to dispense with the aid of the Danes. It may be hoped that the manifold advantages of telegraphs will become so evident to the Chinese as not only to induce them to extend the wires throughout their vast and populous empire, but also to pay some little more attention then they have ever yet done to the many other little dodges which outer barbarians would be only too pleased to put them up to.

Why not do something in electrical heating stoves the same as are being introduced in France, a peculiar feature of their construction being that the wires are let through apertures formed in plates of refractory clay and plumbago. These plates are not enclosed, but are left exposed, so that the air can circulate very freely through the apertures, where it comes in contact with the red hot wires. Wire bobbins are inserted in the apertures, each bobbin forming part of the electric circuit; and all being connected for quantity; the bobbins are heated by the passage of the current, and serve to heat the air as it passes to and fro over them.

To cover a sphere with tin foil, the foil is cut into gores so as to slightly overlap. The very thickest parts are used. Each gore is rubbed with the thumbnail, or side of a test tube, until it lies quite smooth. This the plasticity of the tin permits.

TELEGRAPHIC

.... The Rocky Mountain Telegraph Company's new wire is completed from Medicine Hat on the Canadian Pacific to Fort Assinoboine, which is connected with Helena. The electric circuit is now completed in the Northwest, east and west from the United States *via* the Canadian Pacific.

.... Mr. Warner's bill providing for the construction of telegraph lines by land grant railroads makes it obligatory upon such railroad companies to construct and operate telegraph lines; prohibit discriminations; the secretary of the interior is authorized to enforce fulfillment of such obligations; all unlawful contracts now in force must be annulled and set aside; refusal to conform to this act makes a railroad officer liable to not less than $1,000 fine, and not less than six months' imprisonment.

.... The police and fire commissioners of Detroit have recommended an underground system for the wires of the two departments. They will have put down a half mile of iron or wooden pipe large enough to contain four cables, or of four two-inch pipes in the same trench and make an experimental test to decide among the systems. This can be done for from $1,200 to $1,500, the cost of trenching and connections, as the competing companies will doubtless furnish the material. The four companies whose cables will be tested are the Kerite, the Okonite, the Western Electric and the Waring.

.... Austin Corbin, so one of the biggest men in Wall street says, is now known as the "Peacemaker" in every enterprise he is interested in. "He has just been elected to the Western Union directory," the big man said, "and he intends to insist on peace between the Western Union and the Baltimore and Ohio Telegraph Companies. It may take some time to accomplish this, but it will be done. As I understand the present situation, matters now rest only with Robert Garrett, Another instance of Mr. Corbin's love for peace is his intention to do all in his power to end the bickering between the Pennsylvania and the Reading railroads. He will stop that fight if any man can, and then, I suppose we'll all be happy."

.... During the severe storms of last week at the village of Bradninch, Devonshire, the church tower was struck by lightning. Very serious damage was done, the tower being shaken to its foundation and cracked throughout one-third of its length; one of the pinnacles fell through the roof, and stones from the top of the tower were hurled through cottage windows at a considerable distance. This case is an interesting one, as from the description of an eye-witness there can be no doubt that the destruction was due to a discharge of globe lightning. Balls of fire are described as whirling around the summit of the tower for a second or two, and disappearing with a tremendous explosion.

.... During the great Boston fire an operator in New York received 248 messages between 7 o'clock and noon, and sent 216 during the afternoon of the same day. The messages, including the addresses, signatures, date lines and "checks," averaged thirty words. Thus during the five hours he was wielding the pen he copied over 7,500 words, or 1,500 words an hour. There are a dozen operators in Philadelphia who could beat even that if they were called upon to do it. These men would probably not break the sender once in an hour if the latter was a good operator, and, when through, it is doubtful if they would remember a word they had penned. The operator is simply a machine. The sound of the instrument enters his ear and runs out his arms to the nib of his pen to the paper. The writing becomes almost involuntary.—*Phila. Ex.*

Electro-Motors and Their Government.

Continued from Page Three.

It is not necessary to show here how it follows from the resultant magnetic field in a motor being greater than the field due to the field magnet alone that the armature ought to be magnetically more important in a motor than in a dynamo, as this is fully developed in our paper read before the Society of Telegraph Engineers in 1883. We may, however, state, in reply to the criticisms contained in the *Electrical Review* for December 3d, 1886, that we believe that the reason why the motors made in 1883, in accordance with the principles we laid down, were only as good as other motors made at that time, instead of being far better, arose from bad workmanship and from a certain very definite defect in the design, which, having nothing whatever to do with the question of relative sizes of armature and field magnets, need not be entered into here. Their not being now in general use was certainly not due, as the writer in the *Electrical Review* for December 3d imagines, to the use of, or to the necessity for, differential winding, since it was only in the cases where very constant speed was required that we used differential winding at all. We are also quite as certain that it was not due to any defect in the general principle.

It may be said, then, are there then no experiments supporting our theory? We reply, yes; and a comparison between the large Edison-Hopkinson dynamo when used as a motor and a small Immisch motor which was constructed for use only as a motor and not as a dynamo, will bear out the general correctness of our principles of motor construction. We may mention that Mr. Snell, who is Mr. Immisch's right hand, was a pupil of ours at the Finsbury Technical College, was thoroughly imbued with our principles of motor construction, and has made a most praiseworthy and successful application of them. Mr. Snell has assured us many times within the last two years that all his experiments bear out our view that in a series motor the armature ought to be a much more important part of the machine than the armature of a series dynamo of the same total weight. Without going into the details of the Immisch motor, which would be quite beside the point at issue, it is important to remember that the rough rule followed by the constructors is to make a powerful armature, and to put a field magnet outside only just so must larger than the armature as will allow space for the wire to be wound on the field magnet core.

To enable a comparison to be made between the behavior of the Edison-Hopkinson dynamo, weighing 46½ cwt., with an Immisch motor, weighing 66½ lbs., it is necessary to see how the power and efficiency of a motor vary with its weight. Such a calculation has been made with greater and greater accuracy by M. Deprez, Dr. Hopkinson and Mr. Kapp; but we think that the following is a still more accurate comparison:

Comparison of the Powers and Efficiencies of two Motors.—A′ and A, the linear dimensions of A′ being N times those of A, N being greater than unity.

If current round field magnets of A′ ... } = { × N current round field magnets of A

the number of lines of force per unit area with A′ will be the same as with A.

The total number of lines of force passing through armature of A′ } = { N^2 × total number of lines of force through armature of A.

Hence with the same angular velocity

E.M.F. of A′ = N^2 × E.M.F. of A.

But the angular velocity of the armature of the large machine cannot be as great as that of the armature of the small one.

∴ Let angular velocity of A′..... } = { $\frac{1}{\sqrt{N}}$ × angular velocity of A,

when the maximum centrifugal force per unit mass in the armatures of the two machines will be equal.

Now, E.M.F. of A′ = $N^{\frac{1}{2}}$ × E.M.F. of A.

The diameter of wire on field magnets of A′ } = { N × diameter of wire on field magnets of A;

and if the clearance between the armature and the pole pieces in the two motors were made in the ratio of N to 1, the same ratio would hold for the diameters of the wire on the two armatures. But there is no reason why the clearance with the large motor should be N × clearance with the small one.

∴ let the dia. of wire on armature of A′. } = { $N^{\frac{1}{2}}$ × dia. of wire on armature of A.

If, however, the diameter of the wire on the armatures have this ratio, the current with the large motor may be more than N times the current with the small one.

∴ let current with A′ = $N^{\frac{1}{2}}$ × current with A.

The total number of lines of force passing through the armature A′ will now be more than N^2 × the number of lines passing through the armature of A, but how much greater it will be will depend on how nearly the current used with A saturates the iron cores of its field magnets. Since, however, we desire to compare the maximum powers that the two motors can give out without undue heating, we must assume that the current used with A nearly saturates its field magnet cores. In that case

E.M.F. of A′ = K × $N^{\frac{1}{2}}$ × E.M.F. of A

where K is a constant only slightly greater than 1, say 1.1.

The power given out by A′ = E.M.F. of A′ × current used with A′ approximately.

∴ Power given out by A′ = 1.1 $N^{3\frac{1}{2}}$ × power given out by A.

The resistance of field magnet coils of A′ } = { $\frac{1}{N}$ × resistance of field magnet coils of A.

The resistance of armature of coils of A′ } = { $\frac{1}{N^2}$ × resistance of armature coil of A.

∴ The rate of production of heat in field magnet coils of A′ } = { N^2 × rate of production of heat in field magnet coils of A.

The rate of production of heat in armature coil of A′ } = { N^2 × rate of production of heat in armature coil of A.

The cooling surface of field magnet coils of A′ } = { N^2 × cooling surface of field magnet coils of A.

The cooling surface of armature coil of A′ } Rather more than N^2 × cooling surface of armature coil of A.

Also the angular velocity at the periphery of the armature coil of A′ } = { $\sqrt{N}$ × angular velocity at the periphery of the armature coil of A.

Hence the armature of the large motor A′ is, for two reasons, cooler than the armature of A, while the field magnet of A′ is warmer than the field magnet of A. The temperature of the armature, however, is the more important as it is the armature coil that is generally damaged by over-heating. Further, by making the diameter of the wire on the field magnet of A′ rather more than N × the diameter of wire on the field magnet of A, the field magnets of the two motors can be made to have the same temperature without any appreciable change in the total number of lines of force passing through the armature of A′.

∵ The power wasted in A′ = between N^2 and N^3 times the power wasted in A,

and in order not to give undue advantage to the larger motor A′ let us take $N^{2\cdot6}$, so that

The power wasted in A′ } = { $N^{2\cdot6}$ × power wasted in A,

and since the efficiency of A } = { power given out by A′ / power given out by A′ + power wasted in A′

The efficiency of A′ } = { $1:1\,N^{1\cdot2}$ × power given out by A / $1:1\,N^{1\cdot2}$ × pwr. given out by A + $N^{2\cdot6}$ × pwr. wasted in A

Experiments show that an Immisch motor weighing 66½ lbs., say 70 lbs., gives 1 horse power to the absorption dynamometer with an efficiency of 70 per cent. when the motor runs quite cool for a long period. If then, an Immisch motor were made on the same lines as the small one, but of the same weight as the Edison-Hopkinson dynamo, viz., 46½ cwt., or 5,208 lbs., we should have

$$N = \sqrt[3]{\frac{5208}{70}} = 4.206$$

Substituting this value of N in the above expression for the comparison of efficiencies, we find that the efficiency of this large Immisch motor would be 90.4 per cent.

Similarly substituting the value of N in the expression for the power, we find that the actual power that a motor weighing 46½ cwt., but constructed on the lines of the small Immisch motor, would give out, without undue heating, would be 168 horse.

Let us compare this with the actual behavior of the Edison-Hopkinson dynamo. The highest efficiency reported was 92.6 per cent., not much larger than what our calculation shows that it ought to be, but the power it actually gave out in the trials was only about 48 horse, or less than one-third of what our calculation shows that an Immisch motor of the same type ought to give. We do not much care whether the right answer for the power of a properly constructed motor weighing 46½ cwt., when running cool is actually three times, or whether it is only twice the power actually given out by the Edison-Hopkinson dynamo when used as a motor. It is, at any rate, so much larger than the power this motor did give out, that we consider it conclusively proved that a good dynamo is a powerless motor for its weight.

And if still more evidence be required to prove this result, so well known now to makers of motors, we may mention the following very significant fact. On applying within the last month to one of the largest and certainly one of the most scientific, firms of dynamo makers in England for a motor to give off one horse-power, they replied that they could not construct it to weigh less than 200 lbs. with good efficiency. And this, we believe, was because they could not disabuse their minds of the fact that they wanted a motor and not a dynamo to use as a motor.

Our general principle of constructing motors has been abused, yet an intelligent application of it has led Messrs. Immisch (by also paying attention to all details) to construct what we understand are the most powerful and at the same time the most efficient small motors existing. Our principle of obtaining constant speed by the employment of differential winding has been called superfluous, and yet it was reinvented in France last year by M. Deprez, in America this year by Mr. Sprague, and formed the subject of a very exhaustive series of experiments by Dr. Frölich in Germany during 1885.

To make a tight joint between the cap and neck of a copper flask for generating oxygen gas, use a stiff paste made of glycerine and red lead.

Digest of U. S. Patents on Storage Batteries.

REFERENCES TO FOREIGN PATENTS OBTAINED THEREON.

(THIRTEENTH PAPER.)

1886.

337,298. March 2, 1886. Filed June 13, 1881.
Chas. F. Brush, Cleveland, Ohio.

The invention is stated to "consist in a plate or support provided with a mechanically applied coating of absorptive substance adapted to be transformed into an active coating, and further in a plate or support provided with a mechanically applied coating of granulated or spongy, or porous metallic lead; and further in the method of constructing plates or elements for secondary batteries, consisting in mechanically coating lead or other suitable plates with an absorptive substance adapted to be transformed into an active coating." The drawings show electrodes formed as plain, corrugated, or ribbed plates—perforated, studded, honeycombed, pervious plates.

A covering of felt or pasteboard for the plates is described. There are thirteen claims, two of which relate to the mechanical application of an absorptive granular or spongy coating to a plate or support; five for the construction of the plate or support; one for the combination with an electrode with applied coating of a porous retaining covering; four for the process of coating electrodes with mechanically applied coating; two for a mechanically applied coating rendered coherent by pressure.

337,299. March 2, 1886. Filed June 13, 1881.
Chas. F. Brush, Cleveland, Ohio.

The invention is stated to be, the method of constructing secondary battery elements, or electrodes, by mechanically coating or combining suitable plates or supports with active material—such as red lead or other lead oxide.

This patent contains fourteen claims. The first three relate to the mechanical application to a plate or support of an active material, or material to become active. The next four to the construction of the supports for such active material. The next three to a porous covering for the electrode.

The next one, specifically for red lead, as an active material. The next one for the mechanical application of a layer of active material, in contradistinction to a layer formed by electrical "forming" action.

(Claim one patent of fame, 252,002.)

The next one specifically for the application of red lead prior to immersing electrode in battery fluid; and the last for active material rendered coherent by pressure.

This patent and No. 337,298 are substantially alike, both in drawing specifications and claims. The differentiation being that 337,298 relates to porous, granulated or spongy lead, or an absorptive substance adapted to be rendered active.

While this patent relates to an active material, oxides of a metal or absorbtive substance rendered active.

341,600. May 11, 1886. Filed Jan. 30, 1886.
English pat. No. 3260. March 12, 1886.
James Pitken, London, England.

Describes an electro consisting of a central supporting plate having intermediate ribs cast on its faces, and the recesses between the ribs, packed with active material, over which on both sides of the plate are applied inclosing plates of perforated ebonite.

The central metallic plate may be plain, and the pockets on the enclosing plates.

341,860. May 11, 1886. Filed Jan. 19, 1885.
Charley Sorley, N. Y.

Relates to electrodes formed of a strip or strips of lead so arranged that the edges of the strip or strips are on the surfaces of the plate. Further describes plate-like electrodes formed of a strip of lead with interspaces between the convolutions of the strips. Non-oxidizable terminals are claimed. A method of connecting up the electrodes of several cells is also described.

The construction of small portable batteries are illustrated in the drawings.

An Experiment That Proved Something.

"Gentlemen," said W. T. M. Mottram, the electrician of the Wilmington City Electric Company, as he entered the editorial rooms of the *Morning News* one evening, "I want to show you a little experiment that is worth seeing. In the reports of the fire in the Temple Theater, Philadelphia, the newspapers, or at least all but one that I saw, declared that the flames were started by some drapery coming in contact with an incandescent lamp globe which had become very hot. The statement is absurd. You cannot heat those lamps hot enough to ignite gunpowder, let alone set fire to anything like drapery."

As Mr. Mottram spoke he removed the shade from the lamp over the city editor's desk.

"Now," he continued, "watch what I do. I will take this handkerchief and wrap around the globe." He did so, the light shining through the folds of the silk.

"Just as soon as the glass is broken in one of these incandescent lamps the light is extinguished. Even if the carbon should retain its heat after the glass is shattered, it would not do so long enough to set fire to anything. The carbon, you know, is in a vacuum, and when the least bit of air enters the globe the carbon breaks and the light goes out."

At this juncture the speaker took a pair of heavy pincers from his pocket, and with the warning of "Look, now!" crushed the lighted globe wrapped in the handkerchief.

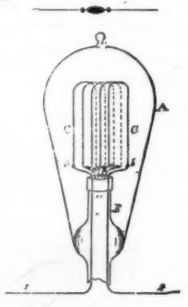
There was a slight explosion, less than the bursting of an inflated paper bag, and the light went out at once. The globe was shattered into particles almost as fine as sand, and the handkerchief was not burned any more than if it had been dipped in a bucket of water.

Mr. Mottram then continued: "There are a great many nervous people, and I want to prove to them, through your eyes, that it is all nonsense to say that fire can be started by an Edison incandescent lamp. They will believe what you say, I know."

A new lamp was then placed under the shade and the experimenter remarked: "The first time I saw this thing done was in the Crystal Palace, London. The American agent of the Edison Company was explaining the working of the lamps to the Prince and Princess of Wales, and broke a globe just as I have done. The Princess was very much frightened. Good evening."

Motors for Electric Lighting.

The difficulty in the way of domestic electric lighting does not arise from the skill required to work a dynamo machine, or even from the cost of the electrical installation, but from the trouble and expense incident to the working of the motor by which the dynamo is driven, says *Engineering*. If the public could be shown that the progress of invention had reduced the cost and risk of motors, without decreasing their efficiency, it is certain that the new form of illumination would extend rapidly. To bring about this result, the Society of Arts have decided to hold a competition of motors in May or June next, and they offer two gold and four silver medals as prizes for the engines most suitable for motors for electric light installations. The competing engines will be divided into two classes: (A) those in which the working agent is also produced, as portable and semi-portable engines, gas engines with producers, and petroleum engines; (B) those to which the working fluid must be supplied, as engines without boilers attached, gas engines without producers, and water motors. Each class will be subdivided into two groups—those declared to develop not more than 10 brake horse-power, and those that will develop more than 10 horse-power and less than 20 horse-power. Application for leave to compete must be made before February 28, 1887, at the offices of the society, John street, Adelphi, London, and an entrance fee of £2 10s. per horse-power must be paid. Unless there are ten entries, no competition will be held, and the fees will be returned. The tests will be carried out under the direction of three judges appointed by the Council of the Society of Arts. The points of merit considered of greatest importance are: (*a*) Regularity of speed under varying loads; (*b*) regularity of speed during the various parts of one revolution; (*c*) power of automatically varying speed to suit arc lights; (*d*) noiselessness; (*e*) first cost; (*f*) cost of running; (*g*) cost of maintenance. There is another point we should have liked to see noticed, and that is the capacity of an engine to be coupled directly to a dynamo. This involves so many advantages in economising space, and in reducing the cost of foundations and gearing, that it ought to be counted as a distinct point of merit; the more so as it always involves some increase in coal consumption. All the cost of fitting up and working the motors must be borne by the exhibitor. This trial comes at a very opportune time; the constant succession of new motors, which some months ago was so rapid, has grown slack, and now each inventor is outrivaling the others in extravagance of the claims he puts forth. Many of these will doubtless exercise a wise discretion in declining the trial; but there should be no difficulty in finding more than ten engines with sufficient merit to encourage their inventors to enter the lists, so soon as the names of the judges are published. This latter point should not be long deferred, as the value of the awards, like that of an oil painting, will greatly depend upon the names by which they are signed. Full particulars of the mode of testing to be adopted should also be published, as few firms of any standing will care to compete under unknown conditions.



New Incandescent Lamp.

The incandescent lamp of which an outline illustration appears on this page, was invented in 1882 by Thos. A. Edison, patent issuing to him two weeks ago. Three claims are made for the lamp as follows:

The coiled or looped carbon filament of an incandescent electric lamp provided with intermediate supports for the coils or loops.

In an incandescent electric lamp, the combination, with the coiled or looped carbon filament, of a number of wires attached to the coils or loops and all sealed in the glass stem of the lamp.

In an incandescent electric lamp the long and fine flexible carbon filament made in one piece, in combination with leading-in wires connected to the ends of the same, and intermediate supports.

The patent was assigned to the Edison Electric Light Company of New York.

—— Messrs. Baker & Co., of Newark, N. J., the largest platinum manufacturers in this country, are to be classed among those generous corporations which remembered every employe with a turkey on Christmas day. This custom is an admirable one, and seems to have been quite generally adopted by electrical concerns.

—— The city council of Pittsburgh, becoming tired of the large gas bills, has appointed a committee to investigate a better method of lighting, either by electricity or natural gas

—— The Waukegan, Ill., Electric Light Company has been incorporated with a capital stock of $5,000. The incorporators are Geo. R. Lyon, E. D. Besley, and Clarence A. Murray. The electric lighting system of the Western Electric Company, Chicago, has been selected.

—— The boiler at the electric light works in Fostoria, O., exploded, and the building was wrecked, and Albert Bailey, the engineer, fatally injured.

—— The contract for furnishing the electric lighting apparatus for the new cruiser Chicago has been awarded to the Edison Electric Lighting Company.

—— The United States Electric Light Company was never so crowded with business in the history of the organization. In the incandescent department, orders are particularly heavy and increasing.

—— The Nashua, N. H., Gaslight Company is to erect, in the company's yard, a building to contain an electric light plant, the company having decided that if the residents of Nashua desire electric light instead of gas, that it will be ready to furnish it. The plant will have three dynamos, which will be driven by two powerful stationary engines.

—— The Brush Company of Buffalo, N. Y., have found it necessary to order three new 100 horse-power boilers, making twelve in all, and three more 65 horse-power Westinghouse engines, making twenty-one in all. The company has a new station in course of construction. It adjoins their present works, and will have a capacity of about 1500 horse-power.

—— The Boulton Carbon Company, of Cleveland, Ohio, is again increasing their already extensive plant, in order to keep pace with the demand for their goods, and when completed will have a capacity, by running night and day, of making one hundred thousand carbons per day. Mr. W. H. Boulton is the general manager, and well known to electric light people.

—— The new plant of the Wilmington Electric Light and Power Company, on Fifth street, near Orange, will be ready for practical operation, if no further delays occur. Although it is ultimately intended to have four 200 horse-power boilers and four engines of the same power, together with eight dynamos, but two boilers, three engines and four dynamos have arrived, which will be sufficient to furnish all the light necessary at present, and which will more than accomplish what the present plant is doing. The old works on Third street have not yet been sold to the Fort Wayne Jenney Electric Light Company, but negotiations to that effect are now in progress.

—— The business of the consolidated Electric Light Company of Portland, Me., is increasing very rapidly. An additional fifty light American machine and lamps was shipped last week from New York. General Manager Sawyer was in this city last week, Friday, on business connected with the American and the Edison Company regarding a further increase of arc and incandescent apparatus. It is probable that he will decide to add about five hundred horse-power electrical motors to the plant. The Sprague motor will be adopted. Mr. Sawyer says that he expects to put in another hundred American arc lights and add a regular central station outfit of Edison incandescent lights as soon as his new building is completed.

—— The City Council of New Orleans has adopted the following: "Resolved that the city surveyor be and is hereby directed to prepare (18) eighteen tracings of that section of the city known as the gas district, on which he shall designate the proper point for electric lights and gas lamps, with a view to the best and most equitable result from either or both—with accompanying specifications—provided, however, that electric lights shall at no point be more than 600 feet apart, or gas lamps more than 150 feet apart. On completion and approval by the City Council of said tracings and specifications, the Comptroller shall advertise—separately for the oil and gas district—for the lighting of same, by gas or electricity, for the term of five years, say, from January 1, 1888, to December 31, 1892, inclusive. The city surveyor shall prepare two sets of tracings and specifications, one to designate the gas district and lamps, as now erected, and one set for that portion of the city outside of the gas district and to be lighted."

ELECTRIC LIGHT NEWS

—— The city of Buffalo is considering the question of purchasing the gas companies. The large gas bills are causing the discussion.

—— A new regulator for dynamo electric machines has been invented by Elmer A. Sperry, of Chicago.

—— The Boston Gas Light Company: Augustus Lowell, president, petition for authority to supply electric light and power to those now supplied by said company with gas.

—— The United States Illuminating Company are adding 1,500 Weston incandescent lamps to their already large plant of 1,400 lamps in the post office in this city. The post office authorities here seem delighted with the plant, as evinced by this large increase.

—— A Grand Rapids dispatch says John R. Markle, of Detroit, was here this afternoon, and met a committee of citizens to discuss the organization of a new electric light company with a stock of $200,000. A number of local capitalists are interested and will push the enterprise.

——Investigations have been going on by the State officials at Springfield, Ill., for some six or eight months regarding electric light for the State Capitol Building. The American System has finally been adopted, and a fifty-light plant was ordered from the American Company on Saturday and was shipped the first of this week.

—— The American Electric Manufacturing Company last week completed arrangements with the well-known electrical firm of Wockatz & Co., of Gothenburg, Sweden, to become wholesale agents for the American Company in Norway and Sweden. Messrs. Wockatz & Co. have done a very large and prosperous business for the Edison Company, and it is expected that they will sell a very large amount of arc light apparatus.

—— Electricity is the modern and potent illuminating agent, and it is very pleasant to know that Waterbury has every appliance at hand for ample adaptation of this agent to its necessity. Extending the hours of lighting to one o'clock in the morning is also a step in the right direction. Waterbury has acquired at a very reasonable price a very excellent and reliable service.—*Waterbury* (Conn.) *Republican*.

—— The dry goods establishment of Adam, Meldrum & Anderson at Buffalo, has been lighted throughout by the Westinghouse system of incandescent electric lighting and presented a brilliant appearance on the opening night. The light was turned on shortly after 4 o'clock in the afternoon and streamed from over 400 lamps attached to the chandeliers. In the show windows were large bulbs of 150 candle-power called "moguls." Two of these in each of the large windows illuminated the street, as well as the space occupied by the windows and their stock. The Westinghouse Company propose to manufacture and sell the apparatus necessary to operate the system, and will guarantee the claims of their patent. It is learned that a company to operate under this system is to be formed in Buffalo, and several of the men interested were among the observers of the successful test. Among those who have investigated the new system with this view in mind are John F. Moulton, James Adams, William S. Frear, Daniel O'Day, Wilson S. Bissell, Charles W. Goodyear and others. There is talk of establishing a plant at Black Rock, where ample water power can be obtained, and it is within the range of possibility that a station may be erected at Niagara Falls for the purpoes of supplying the whole of western New York with the incandescent system.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING DEC. 28, 1886.

354,881 Electric igniter for gas engines; Foree Bain, Chicago, Ill.

354,892 Underground conduit; Josiah S. Du Bois, Camden, N. J.

354,919 Circuit closer; Walter B. Manny, St. Louis, Mo.

354,942 Mechanical telephone exchange; George F. Shaver, New York, N. Y.

354,945 and 354,946 Dynamo-electric machine; Elmer A. Sperry, Chicago, Ill.

354,996 Telegraphic switch; John Absterdam, New York, N. Y., assignor to Jeremiah M. Felton, same place.

355,024 Electric motor; Henry M. Paine, Newark, N. J.

355,032 Telephone receiver; Hans A. Schneekloth, New York, N. Y.

355,055 Signaling apparatus for railway trains; John H. Bickford, Salem, Mass., assignor of one-third to S. Fred Smith, same place.

355,129 Electric arc lamp; James Brady, Brooklyn, N. Y.

355,149 Telephone receiver; Amos E. Dolbear, Somerville, Mass., assignor, by mesne assignments, to the Dolbear Electric Telephone Company of New Jersey.

355,164 Electric heat regulator; Richard L. Guion, Elmira, N. Y.

355,165 Pin holder for electric wire insulators; Mack Hanks, Buffalo, N. Y.

355,172 Electric arc lamp; Richard F. Jones, St. Louis, Mo.

355,185 Wire and pipe-supporting and snow-removing apparatus; Sylvanus D. Locke, Hoosick Falls, N. Y.

355,189 Telephonic apparatus. James F. McLaughlin, Philadelphia, Pa.

355,190 Telephonic apparatus; James S. McLaughlin, Philadelphia, Pa.

355,226 Telephone check apparatus; D. Johnsone Smith and Daniel Sinclair, Glasgow, county of Lanark, Scotland.

BUSINESS NOTICE.

"In making the statements which follow we can verify each and all of themas facts. Mr. Edward P. Thompson, of Temple Court (7 Beekman St.,) New York, is a good man to bring your patent cases to, for he is thoroughly versed in all the ins and outs of a Patent Attorney's duties. The following are some of his qualifications: Graduate of Stevens Institute as Mechanical Engineer. For four years tutor of classes of young men in mathematics and experimental physics at Elizabeth, N. J. Served professionally as Electrician and Chemist in the Swan Electric Company of New York for two years. Because of past successes as a Patent Attorney at 13 Park Row, New York, was appointed, to succeed N. S. Keith, of the patent agency of the *Electrical World* and Associate Editor. N. S. Keith is known as the Translator and Reviser of Schellen's Treatise on "Dynamo Electric Machinery." Mr. Thompson for two years personally prepared and prosecuted all the patent business of *Electrical World's* Patent Agency, and is the author of a series of articles in said paper upon "Analytical and Systematic Method of Inventing," which were widely known and favorably received. Mr. Thompson is a member of American Institute of Electrical Engineers and American Society of Mechanical Engineers. He is author of the "Expansion of Polynomials," which the ablest mathematicians of the world universally commend." —*New York Observer*.

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Fig.259
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Fig.255
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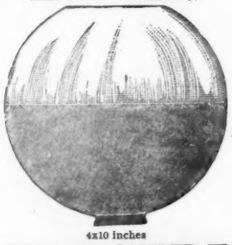

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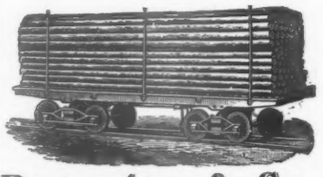

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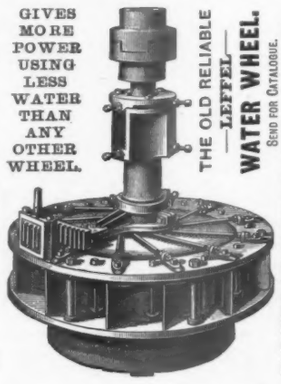

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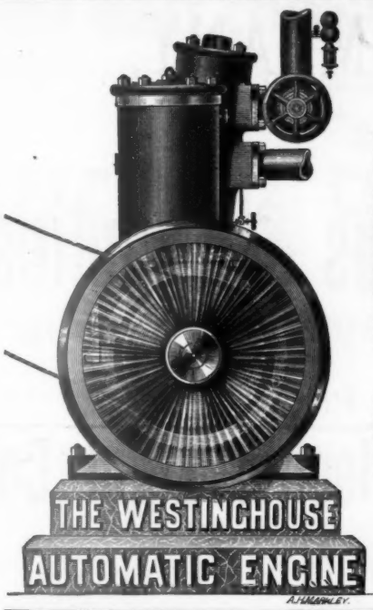

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Mather Electric Co.,		Hartford, Ct.	60
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Miller, Broudy & Co.,		Alexandria, La.	45
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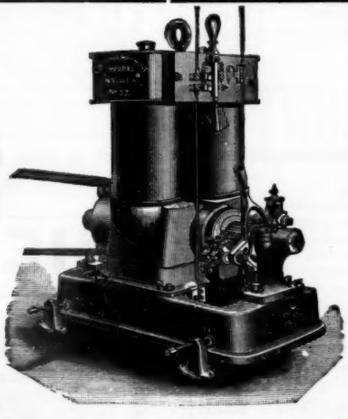

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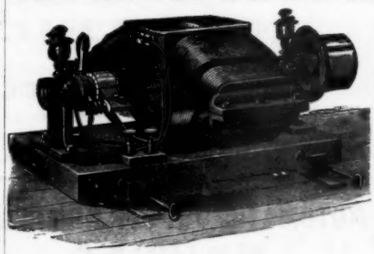

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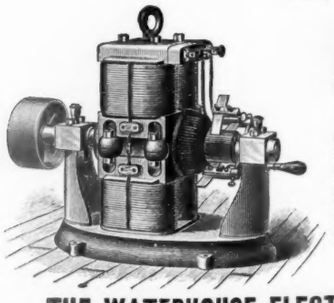

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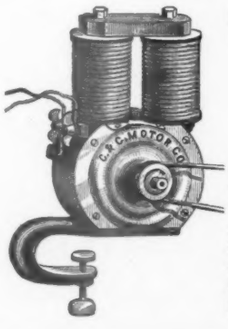

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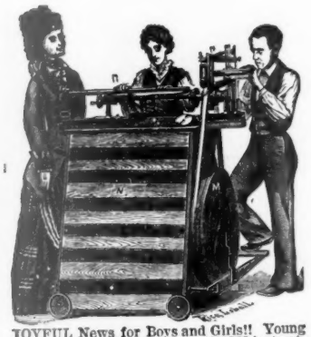

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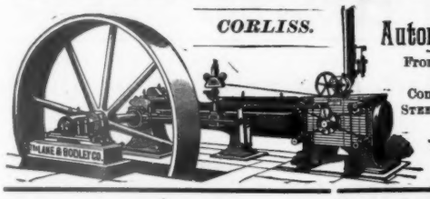

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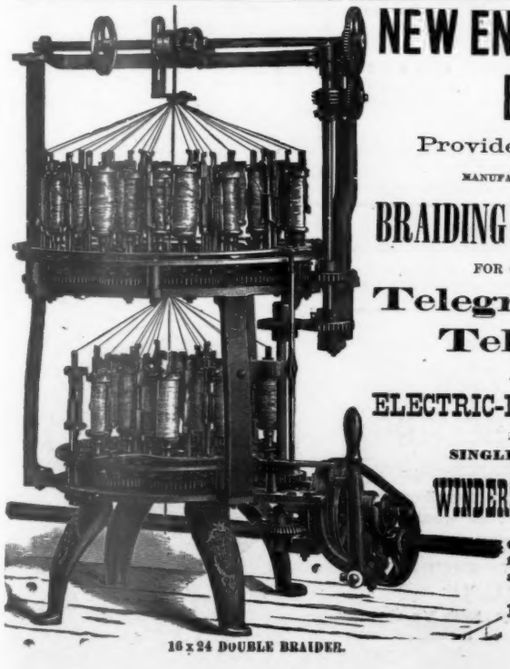

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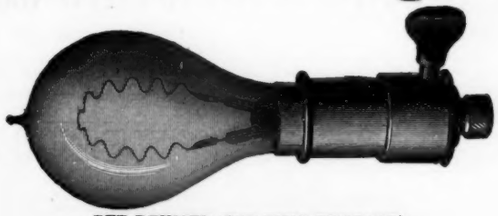

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